DAMA Edmonton Chapter Meeting
January 23, 2020

Emerging Technologies at the
City of Edmonton

Karen Parker
Program Manager, Business Analytics
karen.parker@edmonton.ca
Overview

- Data at the City of Edmonton: A Recent History
- Analytics Centre of Excellence
- Recent and Ongoing Emerging Technology Projects
- What’s Next?
Our Data Journey

2010

Edmonton launches the very first open data catalogue in Canada
Policy & Priority

2015
Edmonton adopts the Open City Policy

2017
Open City Refresh
Open Data by the Numbers

Cumulative Data Assets Released

- 2015: 927
- 2016: 1,241
- 2017: 1,550
- 2018: 2,089

Number of Annual Users

- 2015: 139,047
- 2016: 150,998
- 2017: 234,397
- 2018: 314,088
Open Data by the Numbers

Annual Data Downloads
- 2015: 96,000
- 2016: 22,800,000
- 2017: 50,252,437
- 2018: 170,205,743

Number of Annual Views by Users
- 2015: 560,646
- 2016: 679,983
- 2017: 1,247,392*
- 2018: 1,004,234

* Estimated value
Analytics

- Decision-Support: What should we do?
- Prediction: What might happen?
- Monitoring: What's happening now?
- Analysis: Why it happened?
- Reporting: What happened?

- Advanced Analytics
- Business Intelligence
In 2015...

Edm Mayor Office
@YEGMayorOffice

In speaking to City's partnership w. @StartupEdmonton, @doniveson suggests analytics is next frontier for cities and improving services.

11:58 AM - 5 Mar 2015

Don Iveson
Mayor
Analytics Centre of Excellence (ACE)

Our Mission: To improve data-driven decision making at the City of Edmonton
ACE’s Process: Turning Data into Action

Planning & Direction
- Analytics Strategy, ASIG, Corporate Software choices, Training Program, GIST, Analytics Culture

Dissemination
- Tableau, Web Apps, ODP, IDP, ace.edmonton.ca, R-Brain

Data Collection
- APEX, Survey 123, Web Apps, AppSheet, Custom Dev

Data Provisioning
- IDP, ODP, Discovery Zones, ERP extracts, ESRI web platform

Analysis & Production
- Data science, BI, reports, visualizations, GIS maps, self-service, R-Brain
Analytic project success needs...

1. A **well-defined problem** to solve
2. Stakeholders who are **willing to change**
3. A plan of **what will change** and **who will change it**
Our Recent Emerging Technology Projects...
The City has lots of open-ended text:

- 311 Operator Notes
- Open-Ended Survey Responses
- Social Media
- Plans, Policies, Council Reports, etc.
- News articles, Blog posts, Discussion Forums, etc.
- City Council Meeting Minutes

Problem: How can we give people better access to these disparate unstructured data sources?
Text Depot

- Daily Media Monitoring: >21,000 posts
- Council Reports: >18,500 reports
- Insight Survey Responses: >500,000
- Social Media: >2 million tweets
- PDF Documents

Searchable Text Repository

Search...
Text Depot

TEXT DEPOT

A simplified way to search and analyze topics of interest related to the City of Edmonton.
Click here for information about the data sources.

bike lanes

Matching Documents

Dataset:

Database: Elastic Search

GUI: R/Shiny

Datasets:

CITY COUNCIL PUBLIC HEARING

MINUTES

April 15, 2019 – Council Chamber
Business Problem:

- How to focus inspection resources based on risk?
Safety Codes Inspections Efficiencies

Inputs:
- Building
- Geographical
- Contractor
- Inspection

New Examples

Trained Predictive Model

- Drop: Model Pass
- Keep: Model Uncertain
- Keep: Mandated

Machine Learning Model learns patterns from previous examples in order to predict low risk inspections
Safety Codes Inspections Efficiencies
Safety Codes Inspections Efficiencies
Wildlife Monitoring Image Detection
Wildlife Monitoring Image Detection

- Network of cameras around the city
- Motion-sensor based
- How do we automatically tag whether it’s an animal, human, or empty frame?
Wildlife Monitoring Image Detection

Auto-pixelation of humans
City of Edmonton IoT Network

- Long Range, Wide Area networking protocol (LoRaWAN) designed to wirelessly connect battery operated IoT devices
- Enables the collection of live data from hundreds of sensors for various applications
- Private wireless network - no public cellular service required
- Key features:
City of Edmonton IoT Network

- LoRaWAN Coverage
  (based on theoretical estimations)
Pedestrian Counter

- **Cost-effective** counting solution using a *thermal camera* to count pedestrians by sensing human body heat
- Applies *computer vision* while respecting *privacy*
- Transmits count data through (LoRa) low power and long-range wireless network
Pedestrian Counter

- **Main Hardware**
  - Raspberry Pi Model 3 B+
  - Adafruit AMG8833 IR Thermal Camera Breakout
    - Thermal sensor unit
- **Dragino LoRa/GPS HAT for Raspberry Pi**
  - Allows us to connect/send data over the LoRa Network
  - Also collects GPS data
- **Weather Proof Casing**
- **Total cost under $300!**
Pedestrian Counter

- Currently being piloted on the Edmonton funicular
Soil Moisture Sensor

- Help identify the right time to water the 1500 moveable plants around the City, and therefore prevent the costly loss of plants and replacements.
Soil Moisture Sensor

- Currently being used for City of Edmonton’s street plants
Pothole Detection

- State-of-the-art real-time object detection model, YOLO, to train a custom model
- Existing pothole image training dataset
- Tensorflow Android Demo App open source
- Implementation of REST API by Amazon Lambda serverless function to receive data
Pothole Detection

Dash mounted smartphone detects potholes, sends the locations back in real time without storing and transmitting video data
Pothole Detection
What’s on the horizon?
Traffic Counting

- Original Frame
- Foreground Mask
- KLT Tracking
- Blob Tracking
Automated Snow Clearing Bot
Open Source Code Releases
Questions
THANK YOU